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Exercise Dependence Scale (EDS-21): Translation and Psychometric Validity for Use in Brazilian Dancers

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ABSTRACT

Exercise addiction is a dysfunctional behavior that includes excess and loss of control over physical activity or training, accompanied by negative consequences. The aim of the present study was to cross-culturally adapt the "Exercise Dependence Scale" for Brazilian dancers. Six judges evaluated the items and 338 dancers (Age=15.52 years; ±3.55) responded to the instrument. A prevalence of 54% were identified as symptomatic and 8.7%, as exercise dependent. Principal component and network analysis indicated seven symptom clusters. The instrument demonstrated internal consistency (α=0.84). The norms were developed using Item Response Theory. The "Exercise Dependence Scale" demonstrated validity evidence of its internal structure, making it suitable for evaluating adolescent dancers.

Keywords: Dance; physical exercise addiction; sport psychology; psychometrics; adolescence.

RESUMO – *Exercise Dependence Scale* (EDS-21): Tradução e Validade Psicométrica para Uso em Dançarinos Brasileiros

A dependência de exercício é um padrão disfuncional que inclui excesso e perda de controle sobre atividade ou treino físico, acompanhado de consequências negativas. O objetivo do presente estudo foi adaptar transculturalmente a "Exercise Dependence Scale" para dançarinos brasileiros. Seis juízes avaliaram os itens enquanto 338 dançarinos (M_{idade}=15,52 anos; ±3,55) responderam ao instrumento. Identificou-se uma prevalência de 54% de sintomas e 8,7% de dependência de exercício. Análises de componentes principais e de rede indicaram sete agrupamentos de sintomas. O instrumento demonstrou consistência interna (α=0,84). As normas foram elaboradas utilizando a Teoria de Resposta ao Item. A "Exercise Dependence Scale" possui evidências de validade de sua estrutura interna, sendo adequada para avaliação de bailarinos adolescentes.

Palavras-chave: Dança; dependência de exercício; psicologia do esporte; psicometria; adolescência.

RESUMEN – *Exercise Dependence Scale* (EDS-21): Traducción y Validez Psicométrica para Uso en Bailarines Brasileños

La dependencia del ejercicio es un patrón disfuncional que incluye exceso y pérdida de control sobre la actividad física o el entrenamiento, acompañado de consecuencias negativas. El objetivo del presente estudio fue adaptar transculturalmente la "Exercise Dependence Scale" para bailarines brasileños. Seis jueces evaluaron los ítems mientras que 338 bailarines (M_{edad}=15,52 años; ±3,55) respondieron al instrumento. Se identificó una prevalencia del 54% de síntomas y 8,7% de dependencia del ejercicio. Los análisis de componentes principales y de red indicaron siete agrupamientos de síntomas. El instrumento demostró consistencia interna (α=0,84). Se elaboraron normas utilizando la Teoría de Respuesta al Ítem. La "Exercise Dependence Scale" tiene evidencias de validez de su estructura interna, siendo adecuada para la evaluación de bailarines adolescentes.

Palabras clave: Danza; dependencia del ejercicio; psicología del Deporte; psicometría; adolescencia.

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Although exercise is associated with health promotion, its excessive practice can cause harm, including compulsion or dependence (Marques et al., 2019). Exercise dependence refers to an uncontrollable behavior, excessively performed, which manifests itself through physiological symptoms such as tolerance and withdrawal and psychological symptoms such as anxiety and depression (Hausenblas & Downs, 2002a).

According to Veale (1987), exercise addiction is characterized by the following criteria: a stereotyped pattern of exercise that occurs one or more times a day; an increase in exercise, which is prioritized over other activities; increased tolerance to the amount and frequency of exercises over the years and withdrawal symptoms associated with mood disorders (irritability, depression, anxiety, e.g.) when exercise is ceased. More events such as relieving or preventing the onset of withdrawal symptoms through the practice of more exercises, subjective awareness of compulsion for exercises, and fast reinstallation of previous exercise patterns and abstinence symptoms after a period without physical effort, also characterize exercise dependence. It is interesting to note that these symptoms are like drug addiction (American Psychiatric Association, 2013). Other characteristics may also be associated with exercise dependence (Baptista et al., 2019). For example, even if sick or injured, the individual practices exercise and diets to lose body mass to improve performance. Furthermore, when impeded from exercising, symptoms such as irritability, anxiety, depression, and guilt become constant.

There are few studies which have measured the prevalence of exercise dependence in adolescents, but they have shown that younger age is associated with a higher risk of exercise dependence in adults (Lichtenstein et al., 2014; Tsai et al., 2017; Villella et al., 2011). The participants in referred studies were 13-20 years old, and the countries were Russia, Spain, and Italy. A systematic review in Portugal found the same results, that the risk of exercise dependence in adolescents was observed (Marques et al., 2019). In Brazil, there is a lack of studies on this topic with adolescents. Furthermore, the general mental health of adolescents is often influenced by social relationships, especially during early adolescence (Kapetanovic & Boson, 2020). Peers, schools, and different contexts could influence adolescent psychological health and general development (Sameroff, 2010).

Exercise addiction is an important topic to study in athletes and competition dancers. The investigation of this disorder in these groups can assist in proposing interventions aimed at the prevention of diseases and health promotion. In a classic study, Tomkins (1968) tracked athletes and found that pleasure, satisfaction, and distress relief were the main reasons for excessive training. In the first study involving exercise dependence (Baekeland, 1970), it was shown that athletes who trained three to four days per week, when deprived of their practice, had increased anxiety, sexual tension, and night awakenings, reducing welfare and social life. In dancers, exercise addiction improves performance (Baptista et al., 2019; Marques et al., 2019). Usually, dancers training a lot of hours to improve their performance. There is a strong belief that only physical and technical preparation is enough for a dancer's training. However, psychological aspects are linked to performance. Commonly, dancers are not considered to have other activities and relationships beyond the stage, and dance, in many cases, is inseparable from personal identity (Warnick, Wilt, & McAdams, 2016). Disregarding these issues can harm the health of this population.

Few instruments measure psychological constructs in competition dancers (Silva et al., 2015). Concerning exercise dependence, questionnaires are adapted and validated for use in Brazil (Rosa et al., 2003; Rossi & Tirapegui, 2015). However, dancers have some specificities, such as artistic characteristics that go beyond physical exertion expressiveness is emphasized and needs to be trained; in addition to the differentiated nomenclatures, as we speak, rehearsal instead of training, teacher instead of coach, among others. Besides, no specific instruments yet evaluate this construct in the Brazilian dance population (Silva et al., 2014).

Hausenblas and Downs (2002a) designed and validated a 29-items scale named "Exercise Dependence Scale" [EDS] in the US. The EDS was structured based on addiction symptoms according to the Diagnostic and Statistical Manual of Mental Disorders [DSM-IV] (American Psychiatric Association, 1994). Two years later, the authors designed a short version of EDS with 21 items (Exercise Dependence Scale-Revised - EDS-21) (Hausenblas & Downs, 2002b), which was used in the present study.

Our study aimed to translate and perform a transcultural adaptation, as well as verify the psychometric properties of EDS-21 for use in Brazilian adolescent competition dancers. We hypothesized the following: 1. the EDS-21 would have a good internal consistency reliability by Brazilian adolescent dancers; 2. the EDS-21 would maintain similar psychometric structure to Brazilian adolescent dancers compared with its original version (Hausenblas & Downs, 2002b); 3. confirmatory factor analysis would indicate adequate fit indices; 4. The EDS-21 would have good fit to the measurement model by the item response analysis; 5. the network analysis would show that those items related to the time spent on dancing would be the most relevant factor for determining exercise addiction.

Methods

Participants

This is a cross-sectional study with non-probabilistic sample which recruited participants at Brazilian

national and international dance festivals. The most important dance festivals in Brazil were selected, and all dance companies were invited to participate. Some refused, considering the preparation for the competition, however, it was possible to have access to almost 100% of the high-performance dancers in Brazil.

Our study included a total of 338 Brazilian adolescents, and almost all of them were female (92.6%). Dancers aged between 10 and 19 years (M=15.52; SD=3.55), and it is essential to mention that only one girl was 10 years old; six girls were 11 years old; and the majority were between 14-17 years old. The World Health Organization (n.d.) defines ages 10-19 as adolescents and the present study considers the EDS-21 instrument as an easy-to-understand exercise dependence assessment tool for the targeted participants. The girls had been dancing, on average, for 8.13 years (SD=3.87). The majority had not yet completed elementary school, followed by incomplete high school. They all stated being able to answer the questionnaire without any doubts, showing that the questions were at an appropriate level for cognitive development. The majority (n=171) live in the southeast region of Brazil. Regarding the inclusion criteria, participants should be: 1. between 10 and 19 years old; 2. having experience in at least one of the following dance modalities: (Classical Ballet, Jazz, Contemporary Dance, Hip Hop, Tap, Irish Dance). Those who did not fill out the questionnaire were excluded from the final sample.

Instruments

A **Demographic Questionnaire** was used to describe sample characteristics of the participants. The questionnaire consisted of questions such as sex, age, which type of dance practice, and for how long.

Exercise Dependence Scale-Revised [EDS-21] (Hausenblas & Downs, 2002b) – proposes the athlete to think about situations that occurred during the last three months and rate them on a six-point scale (six being the highest score). The EDS-21 contains 21 questions, with behaviors related to addiction, such as "I spend a lot of time exercising", "I think about exercising when I should be focused on school or work". The scale is divided into seven subscales, containing three questions in each regarding the following aspects: (a) withdrawal, (b) continuance, (c) tolerance, (d) lack of control, (e) reducing other activities, (f) time intention effect. Initially, the instrument showed excellent levels of reliability for internal consistency (Cronbach alpha = 0.92). When the seven subscales were evaluated separately, their contents ranged from 0.67 to 0.92, being considered a valid instrument.

The EDS-21 considers seven criteria for addiction behaviors: (a) tolerance (or need for higher amount of exercise); (b) withdrawal (withdrawal symptoms); (c) effect intention (increases time of exercising than what was originally intended); (d) lack of control (persistent desire to work out); (e) time (lots of time spent on physical exercise); (f) reducing other activities (social, occupational or recreational activities abandoned because of time spent exercising); and (g) continuance (continues to exercise even when physically injured). For each subscale, those who scored between 5 or 6 were classified as "addicted". Subjects who obtain a score of 3 to 4 points are classified as "symptomatic" and those that account 1 to 2 points are classified as "asymptomatic". In the end, individuals who meet three or more DSM-IV criteria (among the seven mentioned), were classified as "exercise addicted". Besides, the EDS-21 provides the following information: (a) the average total score of symptoms of exercise dependence; (b) the difference between - "at risk" for exercise dependence, "non-dependent symptomatic" and "non-dependent asymptomatic"; and (c) specifies that individuals have indicators - physiological dependence or no physiological dependence. It is worth noting that the scale has been validated for adults, requiring changes to be applied to adolescents or children.

Procedure and data analysis

The study was approved by the Research Ethics Committee from the university (*trecho omitido pela revista*), following the standards set by ethical codes. Parents or guardians of the participants were informed about the research objectives, methodology, risks, and benefits. Dancers were included after reading and signing the Informed Consent.

The EDS-21 was submitted to translation and back translation, as proposed by Pasquali (2004). Six bilingual judges participated in this process to evaluate validity (two judges with knowledge in Sport Psychology, two experts in Developmental Psychology, and two experts in Portuguese). First, two judges translated the text, and a synthesis of the translations was made. Following, judges 3 and 4 checked the translation and necessary changes. The transcultural adaptation was performed considering the semantic, idiomatic, cultural, and conceptual equivalences to Brazil. This care occurs with developmental comprehension, too. For professional dancers, even though they are adolescents, the terms are understandable as they are part of their daily physical exercise. The judges considered the terms adequate to adolescents (from 10 years old) because the instrument contains easy questions. Considering the context of adolescents, item 12 of the original scale was changed – "I think about exercise when I should be concentrating on schoolwork." (original) to "Eu penso sobre fazer exercícios quando deveria estar me concentrando no trabalho de escola" (Brazilian version). Judges 5 and 6 performed a back-translation, and the translation was synthesized and presented to the original authors. The original authors approved all of them. After this process, the instrument was applied.

As an initial statistical analysis, demographic and exercise dependence results were compared by ANOVA,

in addition to including descriptive statistics for exercise dependence. The ANOVA was used to check whether there were differences between the groups that would require specific psychometric analyzes for each group and, perhaps, specific normative tables. However, there weren't significant differences.

The psychometric properties of the scale were initially evaluated using Confirmatory Factor Analysis (CFA), with the model adjusted using the Weighted Least Squares Means to seven factors, according to the original revised version of the scale. The appropriate fit indexes were the Comparative Fit Index (CFI ≥0.95 or greater), Tukey-Lewis Index (TLI ≥0.90 or greater), and Root Mean Square Error of Approximation (RMSEA ≤0.08 or less).

Although the model showed good sample suitability from Bartlett's Sphericity Test ($p<0.001$) and Kaiser–Meyer–Olkin (KMO=0.895), the CFA presented an unsatisfactory solution to the Portuguese version. Thus, Principal Component Analysis (PCA) was performed, with Promax rotation, and a seven-factor solution considering only those items with a minimum factor load of 0.3. This model was chosen because it explained a greater variance (71.6%) compared to Exploratory Factor Analysis (59.5%). In addition, other authors have already used PCA as a factorial solution in the EDS-21 assessment of psychometric properties (Allegre & Therme, 2008). The internal consistency was measured by the Cronbach's Alpha.

To assess the psychometric properties of each item we used the Item Response Theory (IRT). A database was generated for the Winsteps software to perform data analysis using the IRT's Rasch Model – *Rating Scale Model* (Linacre, 2014). The latent mean of the respondents was set at zero, and the items could oscillate on the theta scale (θ). The model allows to represent people and items in the same continuum in units of chance logarithms, or logits (log odds). The Infit and Outfit values of each item were estimated and verified. The reference values for Infit and Outfit are between 0.5 and 1.5 (Linacre, 2014). Considering the one-dimensional measurement model, these indices represent the average root of the item residues. The difficulty levels of the items were analyzed to locate them in the latent continuum. Finally, a normative table based on the IRT model was produced.

A network analysis was also carried out to assess the correlation strength between items, as well as the level of centrality based on three measures: connectivity (betweenness centrality), proximity (closeness centrality), and the number of connections between items (degree centrality) (Machado et al., 2015). The network analysis combines different association algorithms with graphic models that indicate which items are most relevant in the instrument and how they are distributed among the seven domains. The Gaussian graph method was used, with the partial correlation estimation procedure gLASSO (Graphical Least Absolute Shrinkage and Selection Operator) (Friedman et al., 2008). The correlation matrix between network items considered the following effect sizes: (0.1=small; up to 0.5=moderate; above 0.5=large).

Results

Validity evidence based on content

Few disagreements between the translations by specialists were detected, which were considered when grouped to compose a single version. As for the back translation, a few differences were found from the original version of EDS-21, and the meaning of only one item was changed. Care was taken with specific Brazilian culture, which is why local popular terms were used, without changing sentence. The language was also adapted to the adolescent population, as the original instrument was designed for adults.

The instrument was initially administered to 35 adolescent competition dancers to verify the comprehension of EDS-21 items. Because EDS-21 was well understood, other adolescents from Brazilian national and international dance festivals filled out the questionnaire. Considering all the described procedures – translations, back translations performed by bilingual specialists, acculturation process, and previous application –, it was perceived that this instrument shows content validity evidence favorable to be used in Brazilian dancers.

Validity evidence based on Internal Structure

To begin the analyses, for exercise dependence, 37% were asymptomatic, 54.3% were symptomatic, and 8.7% were dependent. Considering the number of symptomatic and dependent people, the importance of validating this instrument for Brazil and professional adolescent dancers is clear.

After this, we ran an ANOVA to check whether there were significant differences in demographical variables (age, education, gender, and length of time dancing) and exercise dependence. The findings revealed no significant differences for demographic variables: age (F=0,486; p=0,843); education (F=0,081; p=0,970); gender (F=0,037; p=0,847); length of time dancing (F=0,770; p=0,700). Considering this results, it wasn't necessary to separate the psychometric analysis by groups.

All items on the scale showed good internal consistency by Cronbach's Alpha and the general reliability of the scale was high (α=0.838), with the average score of the items ranging from 2.55 (item 19) to 4.21 (item 10). In addition, all items showed good suitability based on the Kaiser-Meyer-Olkin criterion, and the general suitability index was considered satisfactory (KMO = 0.838) (Table 1).

Table 1
Item and reliability analysis of the Exercise Dependence Scale-Revised [EDS-21] for Brazilian Dancers

	Mean	*SD*	Corrected item-total correlation	Cronbach's α if item deleted	KMO
EDS_1	3.60	1.62	0.313	0.895	0.787
EDS_2	4.05	1.57	0.559	0.888	0.865
EDS_3	4.56	1.33	0.413	0.892	0.791
EDS_4	3.36	1.56	0.554	0.889	0.871
EDS_5	2.57	1.49	0.561	0.889	0.844
EDS_6	3.95	1.53	0.602	0.887	0.864
EDS_7	3.18	1.66	0.543	0.889	0.898
EDS_8	3.58	1.68	0.402	0.893	0.774
EDS_9	4.12	1.60	0.541	0.889	0.850
EDS_10	4.21	1.48	0.388	0.893	0.793
EDS_11	3.21	1.58	0.505	0.890	0.909
EDS_12	3.26	1.74	0.471	0.891	0.897
EDS_13	3.41	1.65	0.607	0.887	0.867
EDS_14	2.77	1.68	0.482	0.891	0.775
EDS_15	3.31	1.68	0.440	0.892	0.782
EDS_16	3.58	1.81	0.560	0.888	0.898
EDS_17	3.99	1.59	0.486	0.890	0.789
EDS_18	2.92	1.56	0.562	0.888	0.869
EDS_19	2.55	1.51	0.564	0.888	0.846
EDS_20	3.90	1.62	0.600	0.887	0.790
EDS_21	3.04	1.72	0.504	0.890	0.775

Note. The overall Cronbach's α of the EDS-21 version was 0.895 and KMO overall was 0.838

Considering all items of the EDS-21, the fit indices of the model with seven factors by using CFI analysis were inadequate (CFI=0.92; TLI=0.89; RMSEA=0.06). For this reason, we conducted a seven-factor PCA analysis (Table 2). This PCA explained 71.60% of the variance; the two main factors were: F1 (11.65%) and F2 (10.49%). All items were maintained in this version because they had a minimum factor load of 0.30.

Table 2
Components loadings for Brazilian Exercise Dependence Scale (EDS-21) (N=338)

	Exercise Dependence Scale EDS-21						
Items	C1– (b)	C2 – (g)	C3 – (d)	C4 – €	C5 – (f)	C6 – (a)	C7 – (e)
IT02	0.851						
IT09	0.822						
IT12	0.508						
IT16	0.776						
IT07		0.702					
IT14		0.956					
IT021		0.822					
IT04			0.800				
IT11			0.849				
IT18			0.880				
IT03				0.819			
IT10				0.899			
IT17				0.816			
IT06					0.676		
IT13					0.675		

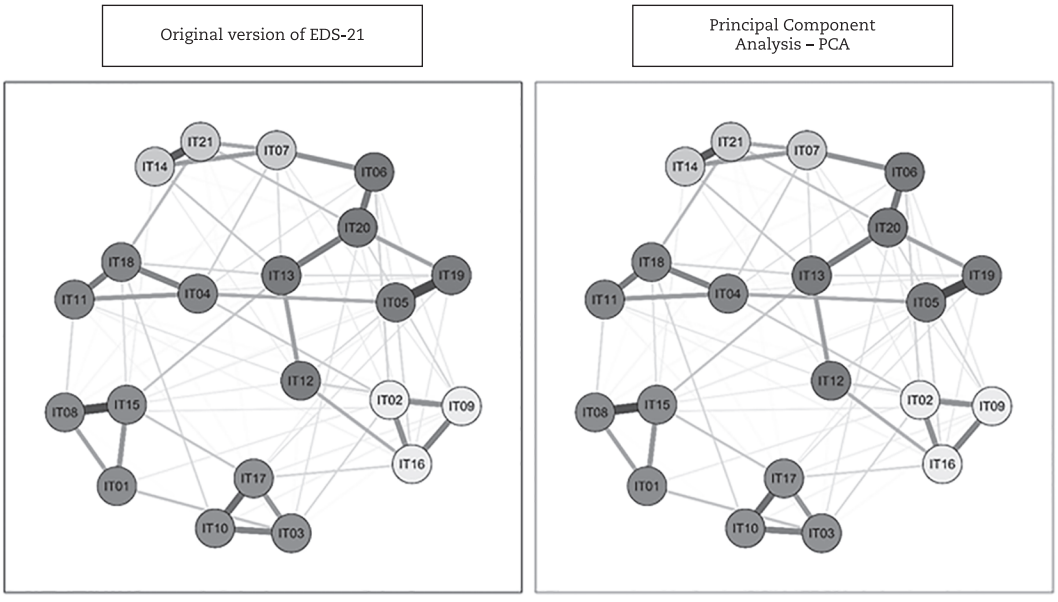
Table 2 (continuation)
Components loadings for Brazilian Exercise Dependence Scale (EDS-21) (N=338)

	Exercise Dependence Scale EDS-21						
Items	C1– (b)	C2 – (g)	C3 – (d)	C4 – €	C5 – (f)	C6 – (a)	C7 – (e)
IT20					0.918		
IT01						0.781	
IT08						0.824	
IT15						0.821	
IT05							0.917
IT19							0.832
Eigenvalue	2.45	2.20	2.20	2.17	2.21	2.10	1.70
Variance (%)	11.65	10.49	10.48	10.35	10.54	10.00	8.10
Cumulative (%)	11.7	22.1	32.6	43.0	53.5	63.5	71.6

Note. The extract method was performed by using Principal Component Analysis, with the Promax rotation method with Kaiser normalization. A cut-off of 0.30 was used for inclusion. Bartlett's test of sphericity = $p<0.001$. – Withdrawal; (b) – continuance, (c) tolerance, (d) lack of control, (e) reducing other activities, (f) time, (g) intention effect

Figure 1 indicates the distribution of the 21 items (nodes) of the EDS-21 (nodes) using the network analysis. The color of the nodes indicated the seven factors of the scale and was presented in three images with the following criteria: (a) Figure 1A showing the domains based on the original revised version of the instrument (Hausenblas & Downs, 2002b); (b) Figure 1B comparing the nodes from the Principal Component Analysis. These data indicated that the nodes for each domain were very close to each other. In addition, the strongest correlations were identified precisely between the nodes of the same domains, mainly between the following items 5-19 (r=0.495), 8-15 (r=0.480), 14-21 (r=0.441), 10-17 (r=0.380). Item 13 – "I spend most of my free time exercising"; item 15 – "I exercise to avoid getting tense", item 20 – "A great amount of my time is spent exercising" presented higher levels of centrality and, therefore, more relevance in the system in relation to the other items.

Figure 1
Network Analysis. Figure 1A – Domains based on the original version of the instrument; Figure 1B – Comparisons from the Principal Component Analysis



Note. in the network, nodes represent the items and edges represent partial correlations. The edges vary in intensity or colour, reflecting the magnitude (the partial correlation coefficient). Green edges represent positive correlation. Red node=withdrawal effects; yellow node=continuance; dark blue node=time; blue node=reducing other activities; dark green node=tolerance; green node=lack of control; rose node=intention effects

Table 3 shows the difficulty of the item and the Infit and Outfit fit indices. The item with the greatest difficulty was item 19 – "I choose to exercise rather than spend time with family and friends". The item 3 showed the least difficulty– "I steadily increase the intensity of my exercises to achieve the beneficial effect desired", meaning that the person needs to have little exercise dependence to endorse this item. All items showed good indexes of fit according to the proposed model.

Table 4 shows the scores standardized of the EDS-21 for adolescent dancers. Differences between the raw and the modeled Rasch scores were detected, which demonstrates an advantage in their use and the possibility of application for other dancers, based on the normative sample.

Table 3
Difficulty of the items and Infit/Outfit fit indices by IRT for EDS-21

Items	δ	Infit	Outfit
19. I choose to exercise rather than spend time with family and friends.	.54	.98	.92
5. I would rather spend time exercising than with my family/friends.	.52	.94	.92
14. I exercise for more time than I wish.	.37	1.21	1.17
18. I am unable to reduce how hard I exercise.	.30	.88	.89
21. I exercise more than I planned.	.21	1.10	1.12
7. I exercise more than I really intend.	.16	.98	.94
11. I am unable to reduce the frequency I exercise.	.14	.91	.92
15. I exercise to avoid getting tense.	.09	1.15	1.16
12. I think about exercise when I should be concentrating in school/work.	.09	1.24	1.36
4. I am unable to reduce how much I exercise.	.07	.83	.91
13. I spend most of my free time exercising.	.05	.82	.87
8. I exercise to avoid feeling anxious.	-.04	1.20	1.20
1. I exercise to avoid getting irritated.	-.04	1.30	1.38
16. I exercise despite persistent physical problems.	-.08	1.03	.99
20. A great amount of my time is spent exercising.	-.22	.87	.85
6. I spend a lot of time exercising.	-.24	.77	.80
17. I steadily increase the duration of my exercises to achieve the beneficial effect desired.	-.28	.96	.97
2. I exercise even with recurrent physical problems.	-.29	.93	.96
9. I exercise when injured.	-.38	1.00	.99
10. I steadily increase the frequency of my exercises to achieve the beneficial effect desired.	-.38	1.07	1.14
3. I steadily increase the intensity of my exercises to achieve the beneficial effect desired.	-.59	.96	1.03

Table 4
Standardization of exercise dependence scores (EDS-21) for adolescent dancers

Score	Measure	Percentile	Score	Measure	Percentile	Score	Measure	Percentile
21	-4.79	0	57	-.39	18	93	.49	84
22	-3.60	0	58	-.36	20	94	.52	85
23	-2.94	0	59	-.34	22	95	.55	86
24	-2.56	0	60	-.31	23	96	.57	87
25	-2.30	0	61	-.29	24	97	.60	89
26	-2.10	0	62	-.26	26	98	.63	90
27	-1.93	1	63	-.24	28	99	.67	91
28	-1.80	1	64	-.21	30	100	.70	92
29	-1.68	1	65	-.19	31	101	.73	92
30	-1.58	1	66	-.17	34	102	.76	94
31	-1.49	1	67	-.14	37	103	.80	94
32	-1.41	1	68	-.12	39	104	.84	94
33	-1.34	1	69	-.09	40	105	.87	95
34	-1.27	2	70	-.07	42	106	.91	95

Table 4 (continuation)
Standardization of exercise dependence scores (EDS-21) for adolescent dancers

Score	Measure	Percentile	Score	Measure	Percentile	Score	Measure	Percentile
35	-1.21	2	71	-.05	45	107	.96	95
36	-1.15	2	72	-.02	48	108	1.00	96
37	-1.10	2	73	.00	50	109	1.04	96
38	-1.05	3	74	.02	51	110	1.09	96
39	-1.00	3	75	.05	55	111	1.14	97
40	-.95	3	76	.07	59	112	1.20	97
41	-.91	4	77	.09	61	113	1.26	97
42	-.87	5	78	.12	63	114	1.32	97
43	-.83	5	79	.14	64	115	1.39	98
44	-.79	6	80	.16	65	116	1.47	98
45	-.76	7	81	.19	65	117	1.56	98
46	-.72	7	82	.21	67	118	1.65	99
47	-.69	8	83	.24	69	119	1.76	99
48	-.65	10	84	.26	71	120	1.89	99
49	-.62	11	85	.28	73	121	2.05	99
50	-.59	12	86	.31	75	122	2.24	99
51	-.56	12	87	.33	77	123	2.50	99
52	-.53	13	88	.36	79	124	2.87	99
53	-.50	14	89	.38	80	125	3.53	99
54	-.47	15	90	.41	81	126	4.71	99
55	-.45	16	91	.44	82			
56	-.42	17	92	.46	83			

Discussion

This study aimed to translate and perform a transcultural adaptation and verify the psychometric properties of EDS-21 for use in Brazilian adolescent competition dancers. The EDS-21 was adequate for use on adolescent Brazilian competition dancers due to good validity evidence observed (content validity – comprehension by adolescents, approved by judges and original authors; good internal consistency by Cronbach's Alpha; good fit indices by PCA analysis; and IRT helped to formulate a normative table with adjusted scores). So, it was possible to confirm the first hypothesis. Considering the psychometric results, the same structure with 21 items can be maintained, even with differences between athletes and adolescent dancers. The reliability found in the present study was $\alpha=0.838$, while the original instrument the authors found $\alpha=0.92$ (Hausenblas & Downs, 2002b).

It's essential to mention that no differences were observed for physical exercise dependence according to age. This could perhaps be explained by the fact that the dancers started competing when they were still children, arriving at this stage already having a long work/training routine. For Batson and Schwartz (2007) the culture of rigor is widely spread and implies that continuous practice is the most beneficial way to improve motor skills. However, most dancers presented themselves as symptomatic and some of them were dependent. This is line with studies by Lichtenstein et al. (2014), Marques et al. (2019), Tsai et al. (2017) and Villella et al. (2011), which showed that adolescents had high rates of exercise dependence and a high risk for it.

The confirmatory analysis did not indicate good fit indexes, but the PCA showed good indicators, as found by some authors (Allegre & Therme, 2008). The analysis of the items also showed good fit, ranging from 0.5 and 1.5, as proposed by Linacre (2014). The normative Table with the modeled Rasch scores will help the application of the EDS-21 in other adolescent dancers, based on a normative sample, which is methodologically favorable. As Rusch et al. (2017) pointed out, the item response theory provides alternatives to the limitations found in the Classical Test Theory, allowing a more appropriate estimate of the true score. It thus becomes a more robust complement to the procedures already used and hitherto published.

The network analysis showed that the time spent on exercise was the one with the greatest centrality, confirming the stated hypothesis. This indicates that teen dancers and athletes spend a lot of time on physical exertion and even choose to do this practice over anything else (Schupp, 2020). These data indicate the importance of items in the instrument assessing exercise dependence. Furthermore, in the network analysis, it was possible to verify a strong relationship between

the item 5 – "I would rather spend time exercising than with my family/friends" and item 19 – "I choose to exercise rather than spend time with family and friends"; item 8 – "I exercise to avoid feeling anxious" and item 15- "I exercise to avoid getting tense"; item 14- "I exercise for more time than I wish" and item 21 – "I exercise more than I planned"; item 10 – "I steadily increase the frequency of my exercises to achieve the beneficial effect desired" and item 17 – "I steadily increase the duration of my exercises to achieve the beneficial effect desired". These strong relationships were already expected, as they belong to the groupings found in the Principal Component Analysis, as well as in the Confirmatory Analysis, which meets the original version of the revised instrument (Hasenblas & Downs, 2002b).

It is worth highlighting the importance of this study as it promotes the adaptation of an international instrument, considering the modality practiced and the age group. There is a gap between methods of psychological assessment and work demand in Brazil when it comes to sports psychology (Peixoto et al., 2016). Few instruments were constructed or validated, indicating the use of instruments without strict psychometric control and their non-reliable applicability (Sperber, 2004), although in Brazil this is starting to change (Queiroz et al., 2016).

As stated earlier, this instrument has a differential in terms of human development. Adolescents are highly susceptible to various dependence types (Marques et al., 2019). At this age, brain formation is not yet complete. The prefrontal lobe responsible for judgments and critical analysis of daily situations only completes itself around 21 to 24 (Arain et al., 2013; Giedd et al., 2013). Adolescent athletes or competition dancers are under daily stressors (Brooks et al., 2013; Liiv et al., 2013; Schupp, 2020) due the competitive level or the desire to have a slimmer and more defined body (Bratland-Sanda et al., 2010; Hale et al., 2010; Schupp, 2020), or yet social acceptance (Warner & Dixon, 2013). They may present cognitive distortions, which lead to emotional and behavioral distortions. Consequently, exercise addiction may develop (Baptista et al., 2019; Marques et al., 2019). Thus, those adolescents who live in an environment risk factor and have cerebral areas in formation, mainly those involved in critical judgement, are vulnerable to this clinical illness (Savage & Dinallo, 2013). This also justifies the possibility of using this instrument, emphasizing that it had satisfactory final psychometric properties.

It was possible to confirm that the instrument has good psychometric properties to be used with adolescent dancers, maintaining the original structure, the adjustment indexes by Item Response Theory were satisfactory, and the time spent factor had greater centrality through network analysis. The only hypothesis refuted was related to confirmatory factorial analysis, which did not present good indexes of adjustments. On the other hand, the PCA indicated the same factorial structure with seven groupings could be maintained.

The main limitation of this study is the validity evidence based on response processes was not performed in relation to external variables and based on testing consequences. Therefore, new studies should be performed so that this evidence may also be assessed. It is fundamental that the relevance of validating instruments in Brazil, as in other countries, be understood. Validation provides greater reliability of instruments and scales, promoting early diagnosis and intervention planning from yielded results.

Although the EDS-21 presented satisfactory psychometric proprieties, it is limited to adolescent competition dancers. Therefore, the EDS-21 should be tested in other types of physical exercise and sports besides verifying validity evidence when administered to other age groups.

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Authors' contributions

We declare that all authors participated in the preparation of the manuscript.

Availability of data and materials

All data and syntax generated and analyzed during this research will be treated with complete confidentiality due to the Ethics Committee for Research in Human Beings requirements. However, the dataset and syntax that support the conclusions of this article are available upon reasonable request to the principal author of the study.

Competing interests

The authors declare that there are no conflicts of interest.

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APÊNDICE

Exercise Dependence Scale – 21

(Hausenblas & Downs, 2002b; adaptado para bailarinos brasileiros)

Nome(iniciais):_____

Data: _____

Local: _____

Horário: _____ Duração: _____

Aplicador: _____

Instruções: Usando a escala abaixo, por favor, complete as seguintes questões tão honestamente quanto possível. As questões se referem a crenças e comportamentos comuns que tenham ocorrido nos últimos 3 meses. Por favor, coloque sua resposta no espaço em branco disponível em cada frase.

1	2	3	4	5	6
Nunca					Sempre

1. Eu faço exercícios para evitar me sentir irritado.	1	2	3	4	5	6
2. Eu faço exercícios apesar de ter problemas físicos recorrentes.	1	2	3	4	5	6
3. Eu aumento continuamente a intensidade de exercícios para conseguir o efeito ou benefício desejado.	1	2	3	4	5	6
4. Eu sou incapaz de reduzir meu tempo de exercícios.	1	2	3	4	5	6
5. Eu prefiro mais fazer exercício que passar um tempo com a família ou amigos.	1	2	3	4	5	6
6. Eu gasto muito tempo me exercitando.	1	2	3	4	5	6
7. Eu faço mais exercícios do que planejo.	1	2	3	4	5	6
8. Eu faço exercícios para evitar me sentir ansioso.	1	2	3	4	5	6
9. Eu faço exercícios quando estou machucado.	1	2	3	4	5	6
10. Eu continuamente aumento a frequência de exercícios para conseguir o efeito ou benefício esperado.	1	2	3	4	5	6
11. Eu sou incapaz de reduzir a frequência com que faço exercícios.	1	2	3	4	5	6
12. Eu penso sobre fazer exercícios quando deveria estar me concentrando no trabalho de escola.	1	2	3	4	5	6
13. Eu gasto muito do meu tempo livre me exercitando.	1	2	3	4	5	6
14. Eu faço exercícios por mais tempo do que espero.	1	2	3	4	5	6
15. Eu faço exercícios para evitar me sentir tenso.	1	2	3	4	5	6
16. Eu faço exercícios apesar de ter problemas físicos persistentes.	1	2	3	4	5	6
17. Eu aumento continuamente a duração dos exercícios para atingir o efeito ou benefício desejado.	1	2	3	4	5	6
18. Eu sou incapaz de reduzir a intensidade com que faço exercícios.	1	2	3	4	5	6
19. Eu decido quando me exercitar, de forma que posso passar um tempo com minha família ou amigos.	1	2	3	4	5	6
20. Uma grande parte do meu tempo eu gasto me exercitando.	1	2	3	4	5	6
21. Eu faço exercícios por mais tempo do que planejo.	1	2	3	4	5	6

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